

Standards and a Commercial SensorNet Node

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- **3eTI Corporate Overview**
- **Commitment to Standards**
- **IEEE 1451 Overview**
- **SensorNet Node Development**
- **Pilot Deployment at Fort Bragg**
- **Summary**

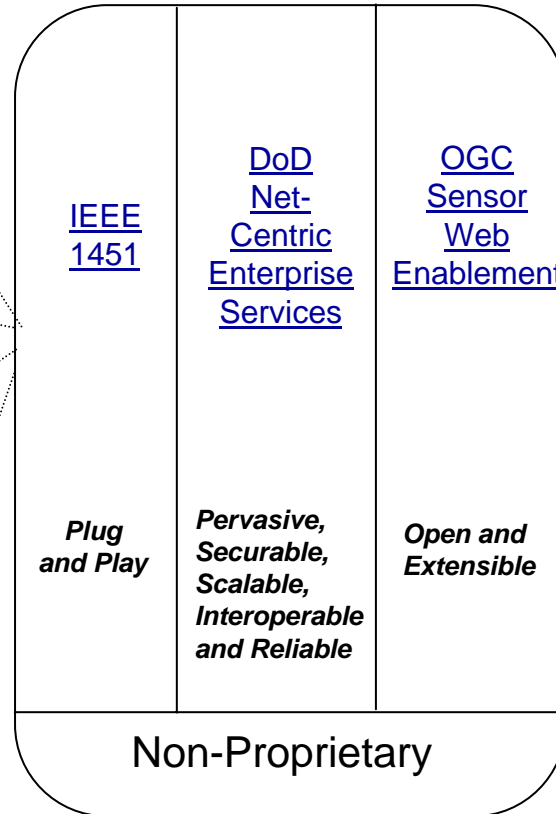
Corporate Overview

<u>History</u>	<u>Vision</u>
<ul style="list-style-type: none"> Established in 1996 2004 Annual Revenue: \$26M Employees: 130 SBIR Success Story <ul style="list-style-type: none"> –16 Phase I, 8 Phase II & 7+ Phase III Contracts \$200M+ in active SBIR Phase III contracts Recipient of the Navy SBIR “Tibbetts Award” Washington Business Journal: <ul style="list-style-type: none"> –Washington DC Metro Area 5th Fastest Growing Company (2002) Offices in Rockville, MD (HQ); Blairsville, PA; Indiana, PA; Dahlgren, VA; Corona, CA; Panama City, FL. 	<ul style="list-style-type: none"> An entrepreneurial company that transforms ideas to quality business
	<u>Mission</u>
	<ul style="list-style-type: none"> To dominate all our markets focusing on innovative and integrated location and condition dependent wireless solutions
	<u>Products & Technologies</u>
	<ul style="list-style-type: none"> Secure Wireless Networking Wireless Sensor Interface Devices <ul style="list-style-type: none"> – RFID, Video, & NCAPs Asset & Location Tracking/Management



ORNL SensorNet Overview

Many Sensors



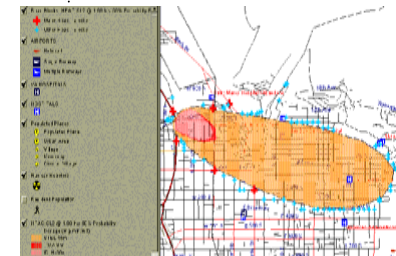
Many Applications



Command-and-Control



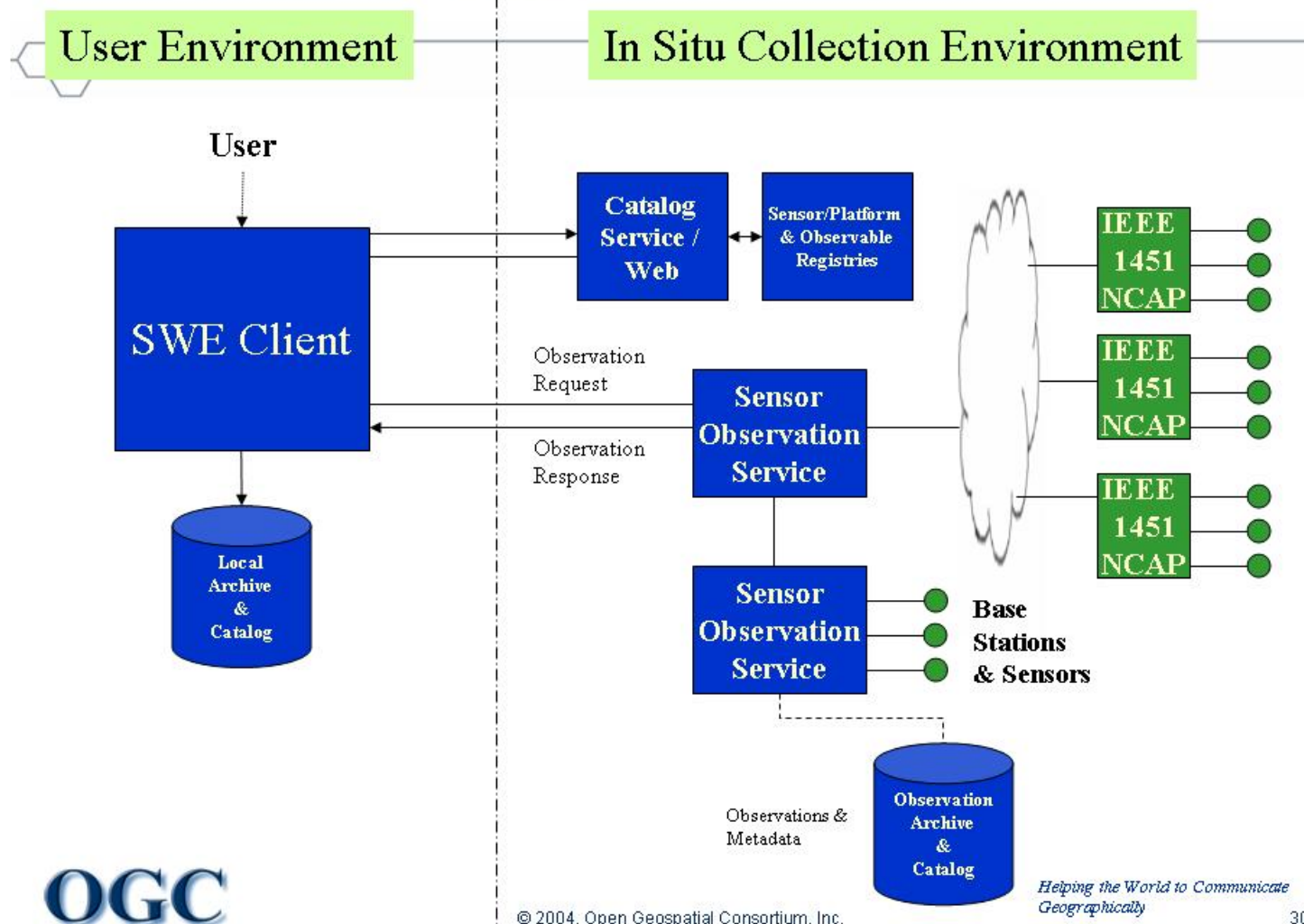
Field and End-User Support



Analysis, Modeling, and Prediction

OGC Sensor Web Enablement

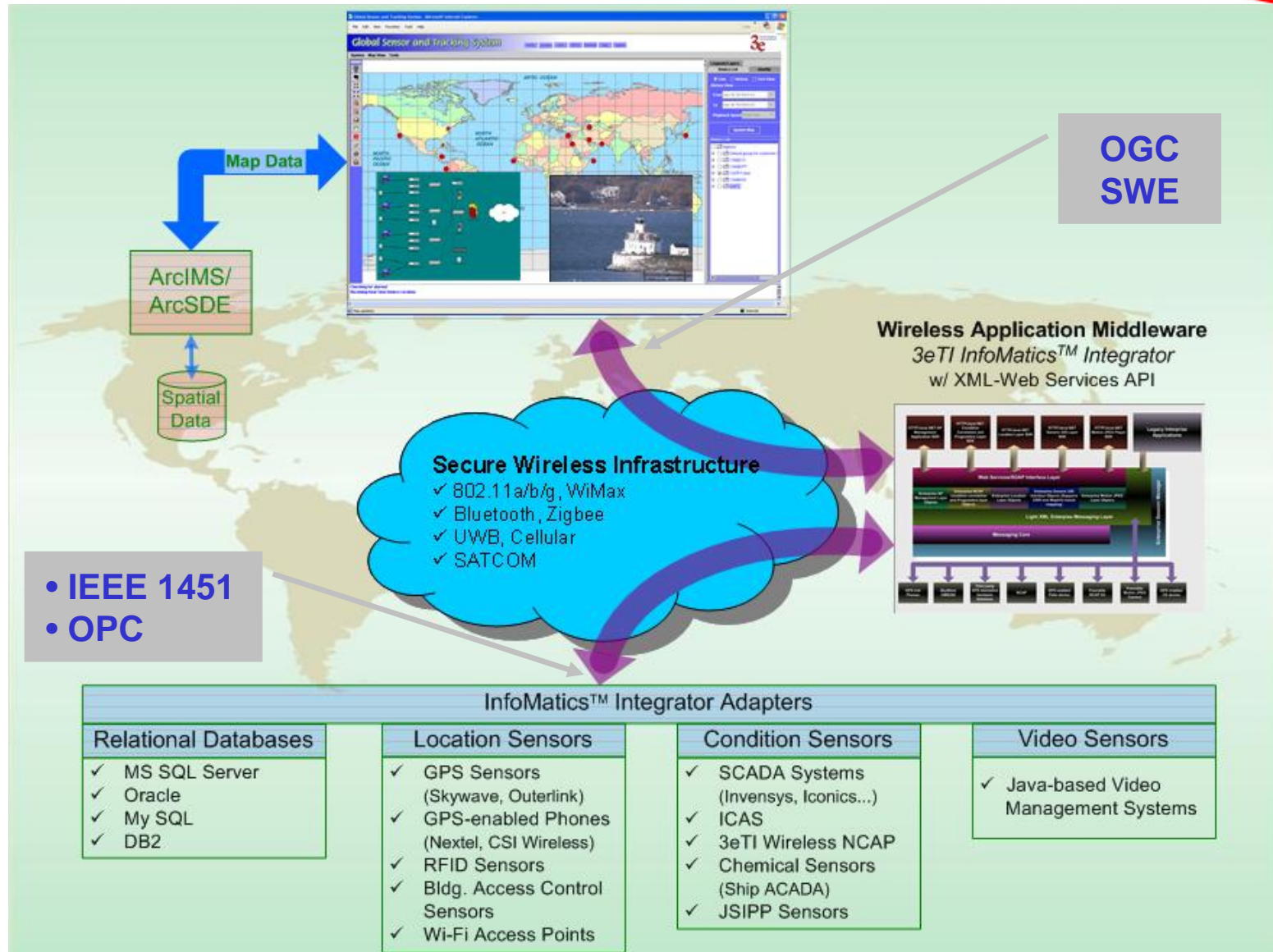
Extended Sensor Observation Service



3eTI Commitment to Standards

- **Active Participation in Standards Organizations**
 - IEEE 1451 – Smart Transducer Interface for Sensors and Actuators
 - Steven Chen, 3eTI CEO, 1451.5 Subcommittee Chair
 - Open Geospatial Consortium
 - Associate Membership
 - Bluetooth Special Interest Group
 - 3eTI is a Subcommittee Chair
 - Zigbee Alliance
 - Member
- **Updating InfoMatics™ Architecture with Open Standards**
 - IEEE 1451.0, 1451.2, 1451.4, 1451.5
 - OGC
 - Implementing WFS, SOS, SAS
 - Actively participating in SWE Working Group, OWS-3, and SAS IE
- **Teaming with ORNL SensorNet Program**
 - 3eTI is the SensorNet Node Manufacturer for the BEST Project

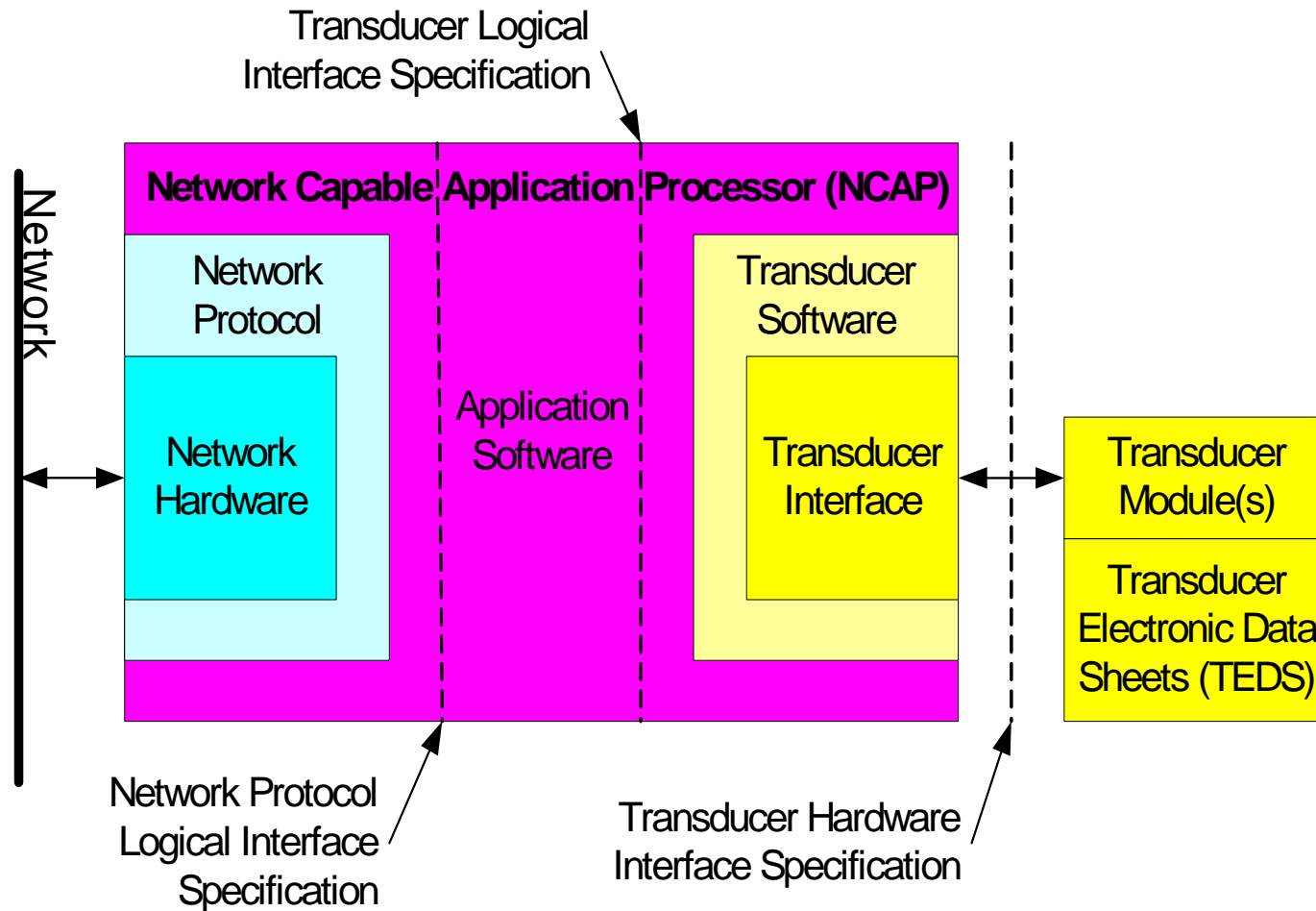
InfoMatics™ Architecture



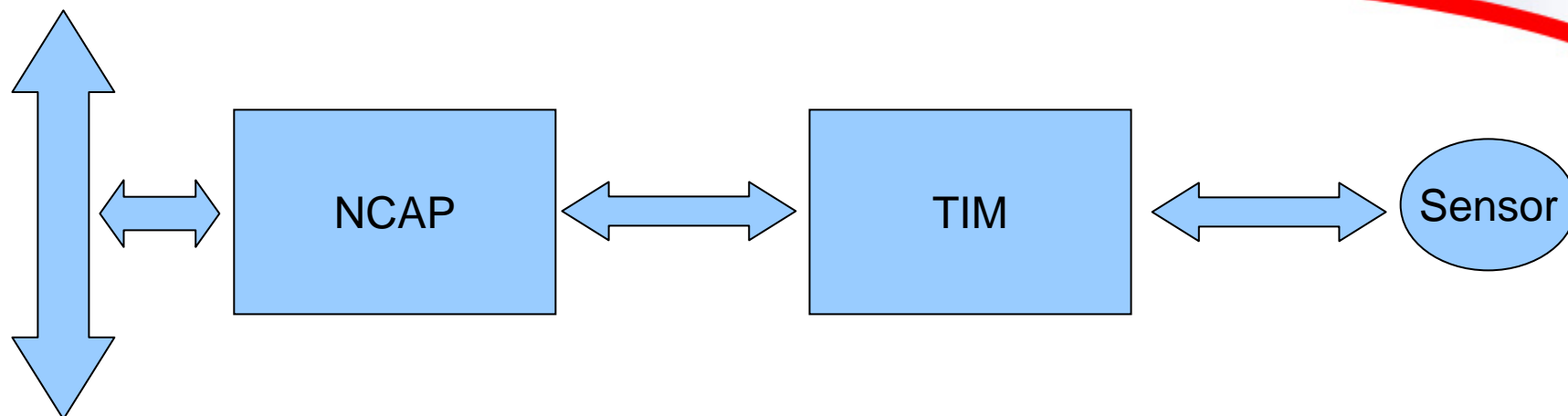
IEEE 1451 Primer

Plug & Play of Sensors

- Extensible Transducer Electronic Data Sheet (TEDS)
- General calibration/correction model for transducers
- Data models based on common standards such as IEEE floating point numbers
- Physical units representation based on SI units
- Control and operation models for different kinds of transducers
- Flexible correction engine concept
- All of the above must be common in order to have a basis for a common TEDS



Comparison of the 1451.x Implementation

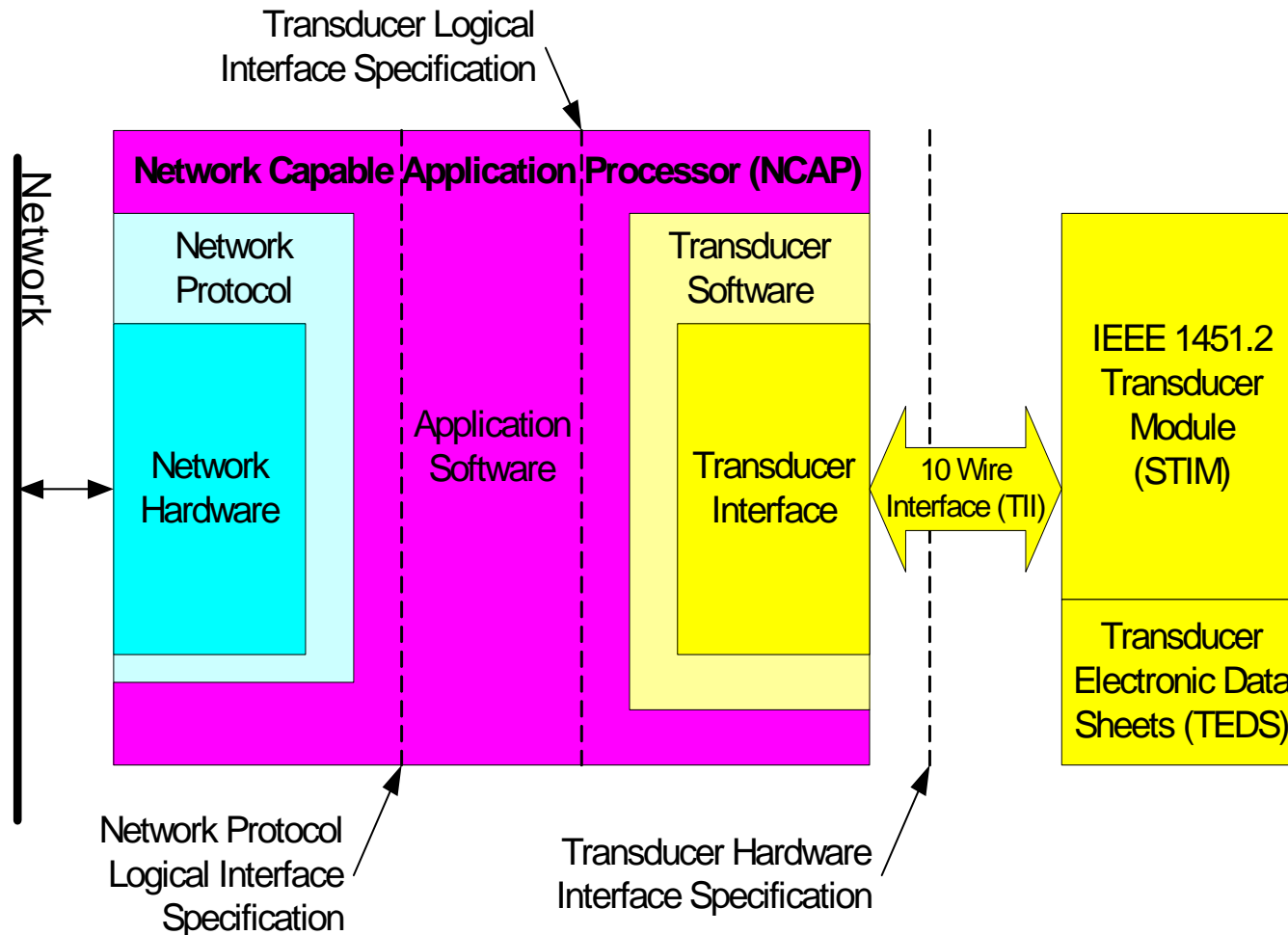


1451.0	Generic TEDS and maybe some protocol level				
1451.1	T-Block (Object Model)				
1451.2	TEDS	10-wire (SPI, Sync, Power)	PHY TEDS (ADC is here)	Must be connected	Part of STIM
1451.3	TEDS	Multi-drop (HPNA)	TEDS (ADC is here)	—	—
1451.4	—	—	—	1-wire	TEDS
1451.5	TEDS	Wireless	PHY TEDS		Dot4 TEDS

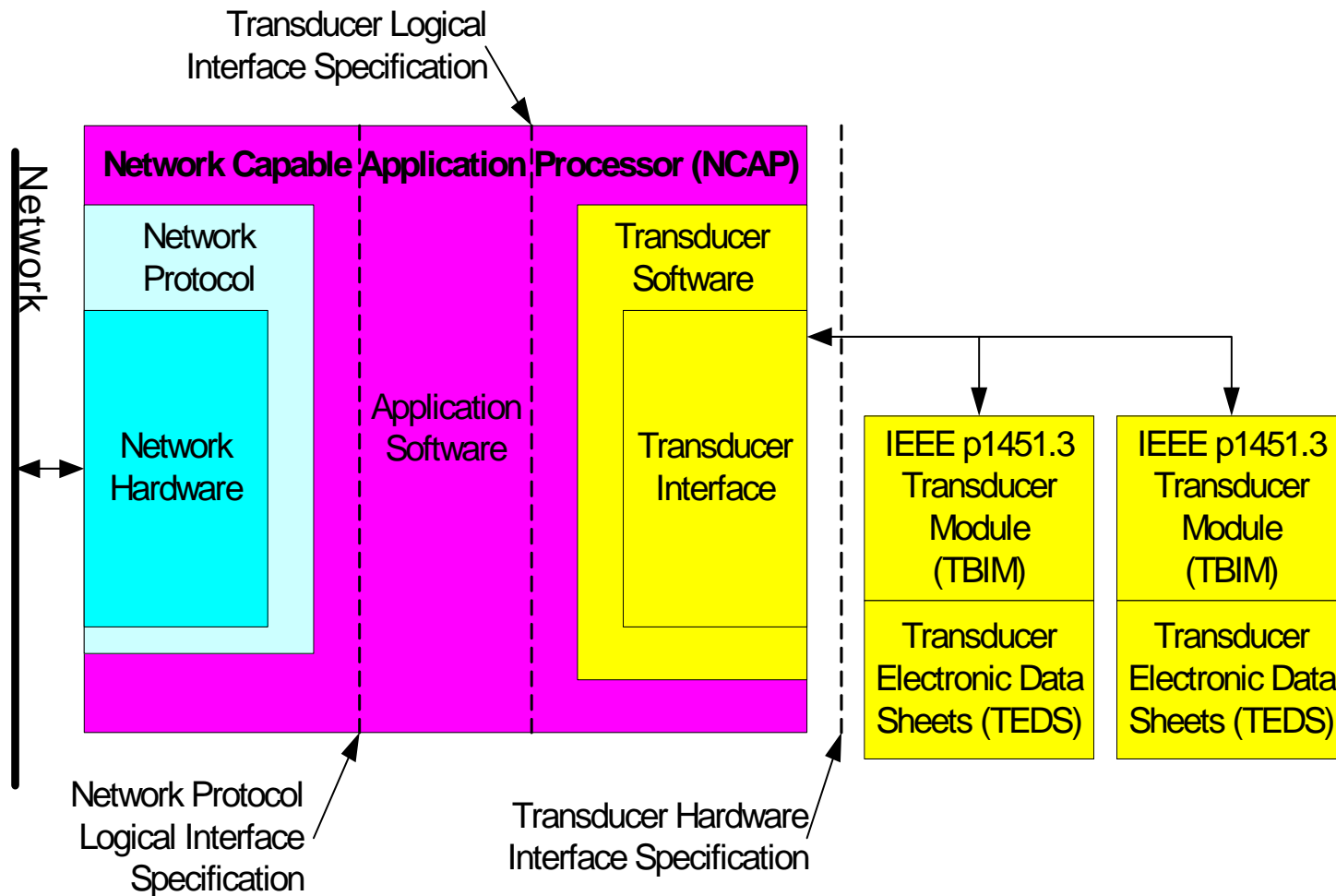
- IEEE Std 1451.1-1999, Standard for a Smart Transducer Interface for Sensors and Actuators - Network Capable Processor Information Model
- Describes the software in the NCAP
- Provides common software interfaces between different networks and the transducer modules

- IEEE Std 1451.2-1997, Standard for a Smart Transducer Interface for Sensors and Actuators - Transducer to Microprocessor Communication Protocol and Transducer Electronics Data Sheet (TEDS)
- One transducer module (STIM) per NCAP
- Developed the basic TEDS
- 10-wire Transducer Independent Interface (TII)

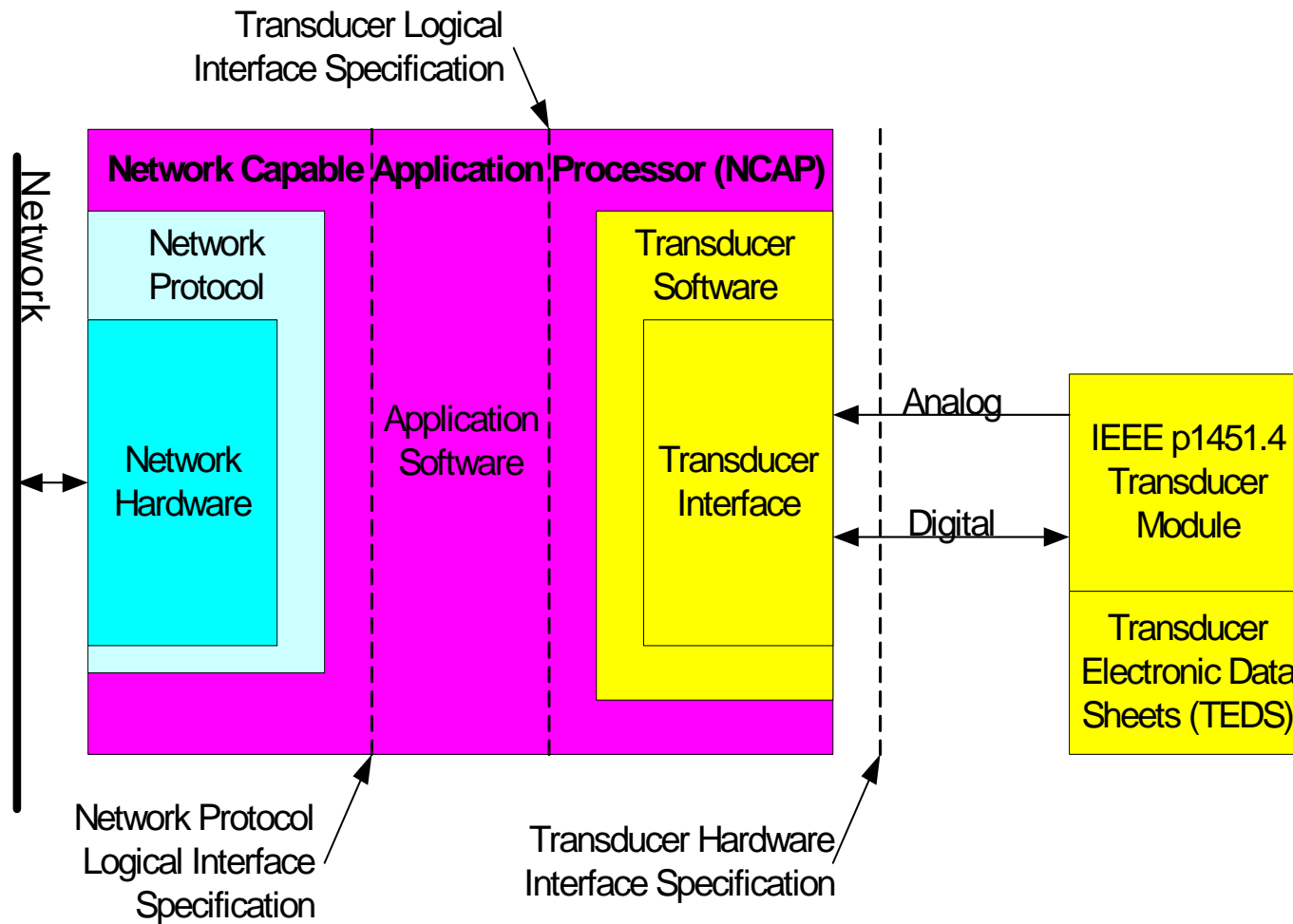
IEEE Std 1451.2-1997



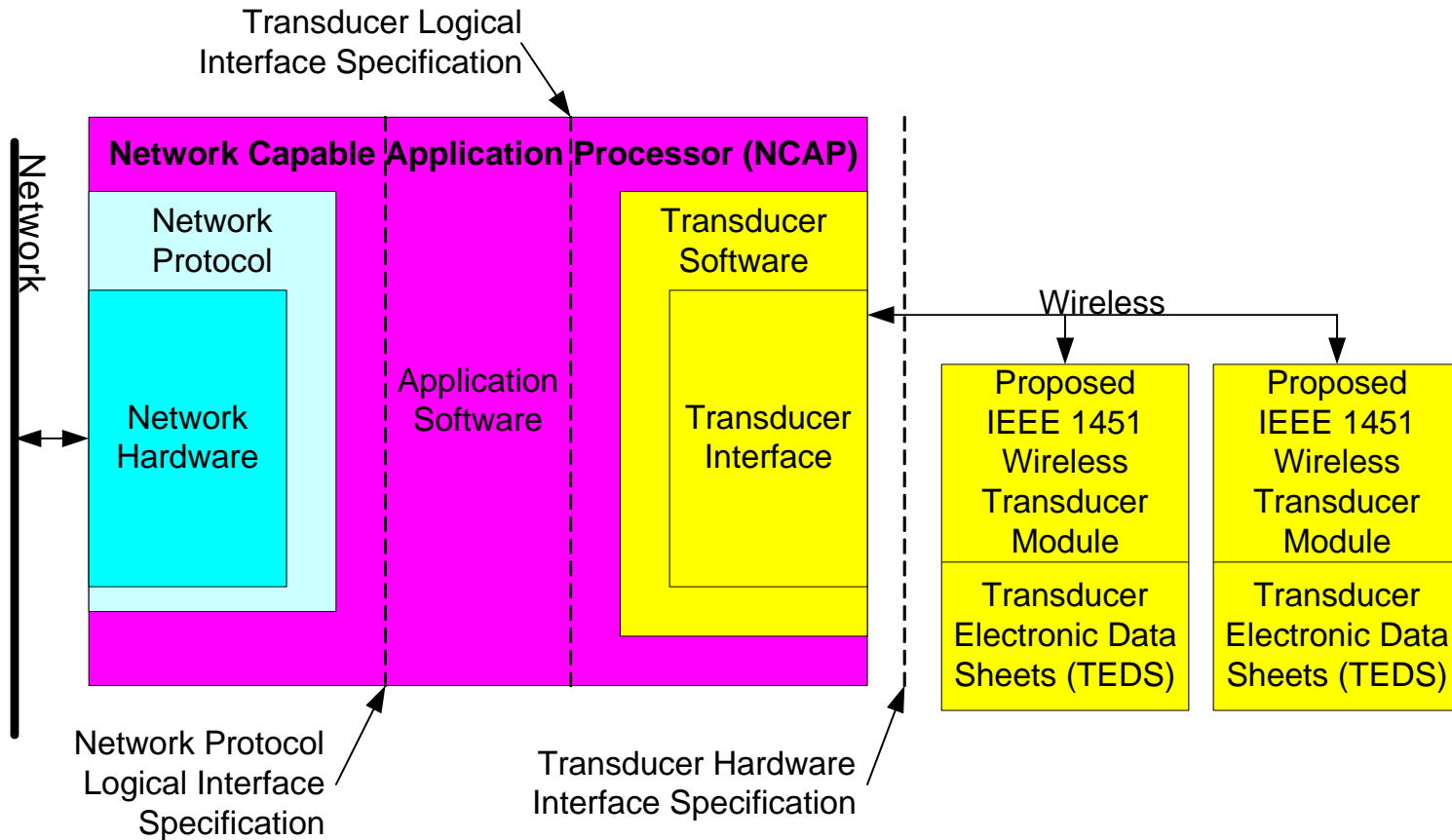
- IEEE P1451.3 Draft Standard for A Smart Transducer Interface for Sensors and Actuators - Digital Communication and Transducer Electronic Data Sheet (TEDS) Formats for Distributed Multi-drop Systems
- Derived from IEEE Std 1451.2
- It uses bussed transducer modules (TBIMs) per NCAP
- Allows the user to define the number and types of transducers on the NCAP
- TEDS utilize XML and Binary XML
- TEDS may be in the TBIM or Remote
- Additional TEDS added
- An attempt is made at a layered protocol



- Originally intended to allow transducer modules to be connected to an NCAP using existing 4 to 20 ma factory wiring
- Other Analog interfaces are allowed
- One TEDS that is very small (256 bits)
- Data interface is analog
- Uses Dallas Semiconductor (Maxim) one-wire interface for the digital interface.



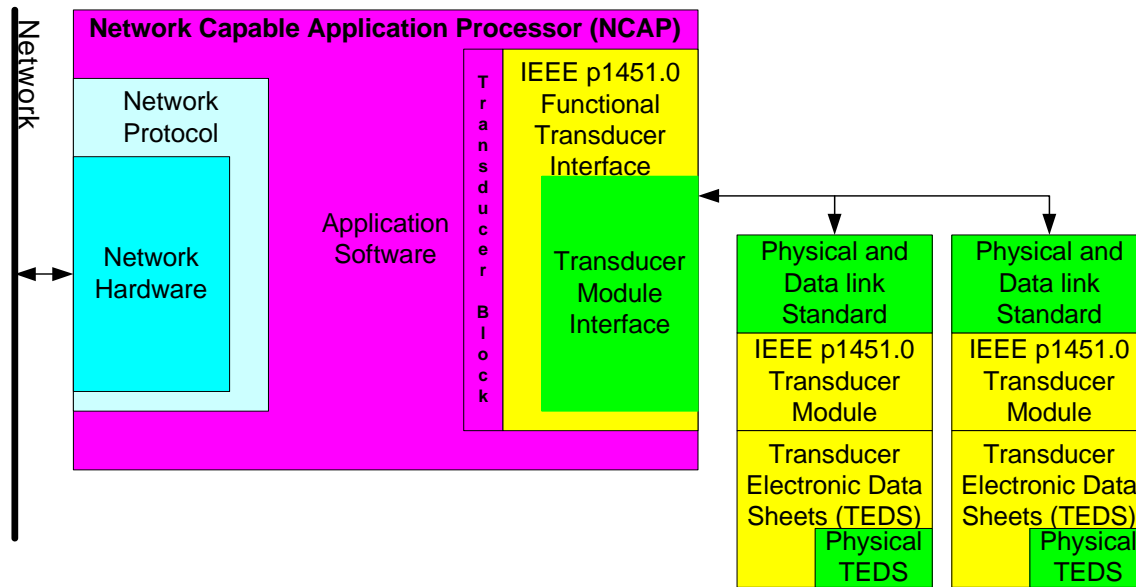
- The working group has decided to include multiple PHY and MAC standard wireless protocols
 - IEEE 802.15.4 / ZigBee
 - IEEE 802.11 / Wi-Fi
 - IEEE 802.15.1 / Bluetooth
- Each PHY / MAC combination provides a higher layer API interface for seamless interoperability with IEEE 1451.0



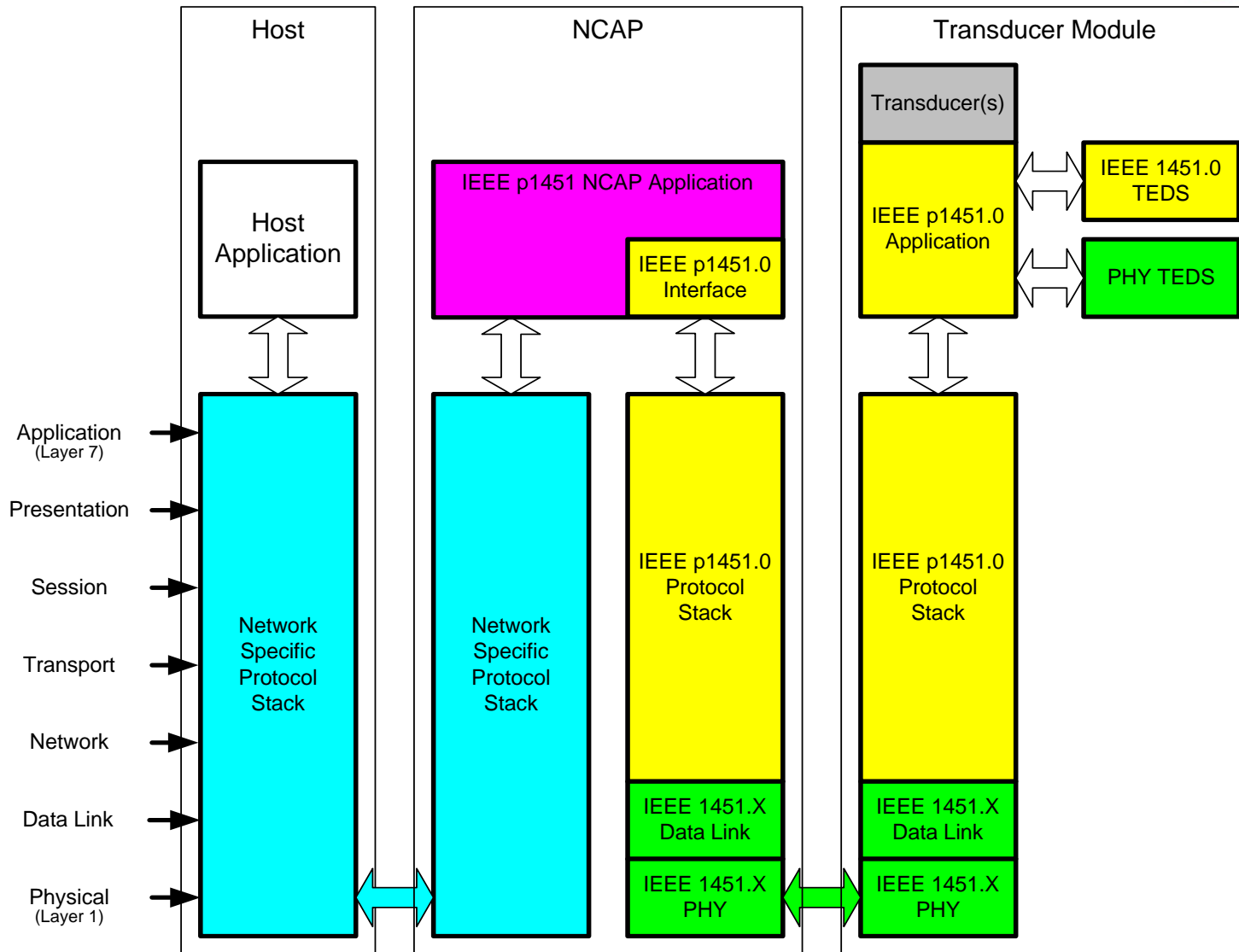
IEEE P1451.0 Block Diagram

Legend

Optional Network Standards (Not 1451)
Optional Network Standards (Not 1451)
IEEE 1451.X NCAP (May include IEEE 1451.1 or other software interface)
IEEE p1451.0 Functional Standard
IEEE 1451.2, IEEE p1451.3, IEEE p1451.4, IEEE p1451.5 or etc.



IEEE P1451.0 Architecture



Proposed IEEE P1451.0 TEDS Architecture

Machine readable

Meta-TEDS

(mandatory)

Channel TEDS

(mandatory)

Calibration TEDS

Physical layer

Meta-TEDS

(Dot-X specific)

Physical layer

Channel-TEDS

(Dot-X specific)

Human readable

Meta-ID

TEDS

Channel ID

TEDS

Calibration
ID TEDS

Application specific

End Users'
Application
specific
TEDS

Future extensions

Industry
Extension
TEDS

Everything not "Dot-X specific" is defined in IEEE P1451.0

Commercial SensorNet Node

Candidate Platforms

3e-528 Wireless Sensor Node

- 4 Channel Video Server
 - With analog to digital video conversion
- 4-Port Serial Server
 - PTZ Control
 - Interface other Sensors (Radar, Chemical Detectors, Seismic...)
- *Auto-Forming* bridging feature enables Mesh Networking
- Wireless Mesh Network enables rapid deployment and reduces implementation costs
- Wireless WAN: 802.11b/g
 - Supports Advanced Bridging w/ 3 IEEE 802.11g bridging ports
- Enables a local 802.11b “hotspot”
- Based on FIPS 140-2 Validated AES/3DES Cryptology
- NEMA 12/13 case

Currently Employed by U.S. Navy CAPS Project



[Link to Data Sheet](#)



- Single port w
- Highly secure
- Lower cost 8
- Local 802.11
- Warns of app
- Provides cov
- Tracks threats as they unfold

video conversion
es
structure
responders

3e-523 Wireless Serial Server

- Secure Wireless Serial Server
 - IEEE 802.11b/g/a Bridging
 - 10/100 Ethernet
 - RS232/RS485 Serial Port
- Wirelessly Enable Serial Devices
 - CBRNE Sensors
 - RFID Readers
 - Weather Sensors
 - Other Analog/Digital Sensors
- SOAP API
- *Auto-Forming* bridging feature enables Mesh Networking
- Reduces infrastructure costs associated with sensor integration
- Based on FIPS 140-2 Validated AES/3DES Cryptology
- Rugged NEMA-4 Enclosure
 - Rating: -25°C to 65°C



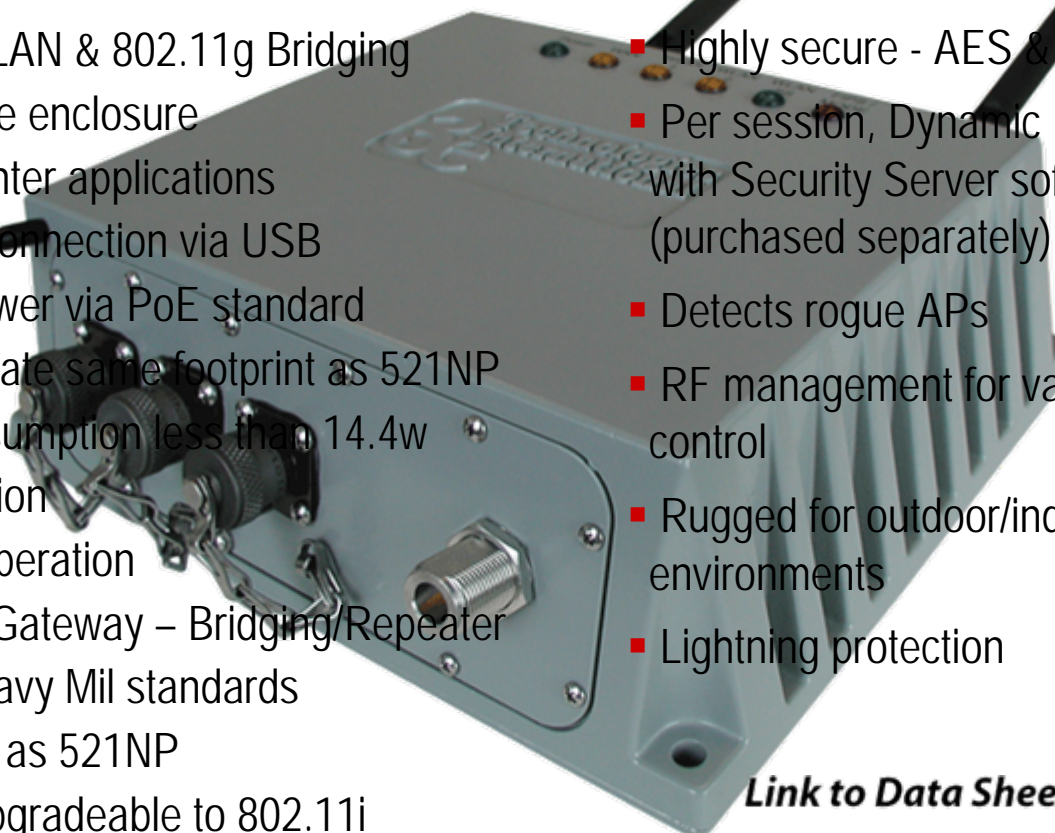
Features

- 802.11b WLAN & 802.11g Bridging
- NEMA 4 type enclosure
- USB for printer applications
 - GPS connection via USB
- Primary Power via PoE standard
- Mounting plate same footprint as 521NP
- Power consumption less than 14.4w
- IPv6 migration
- Tri Mode Operation
 - AP – Gateway – Bridging/Repeater
- Meets all Navy Mil standards
 - Same as 521NP
- Software upgradeable to 802.11i

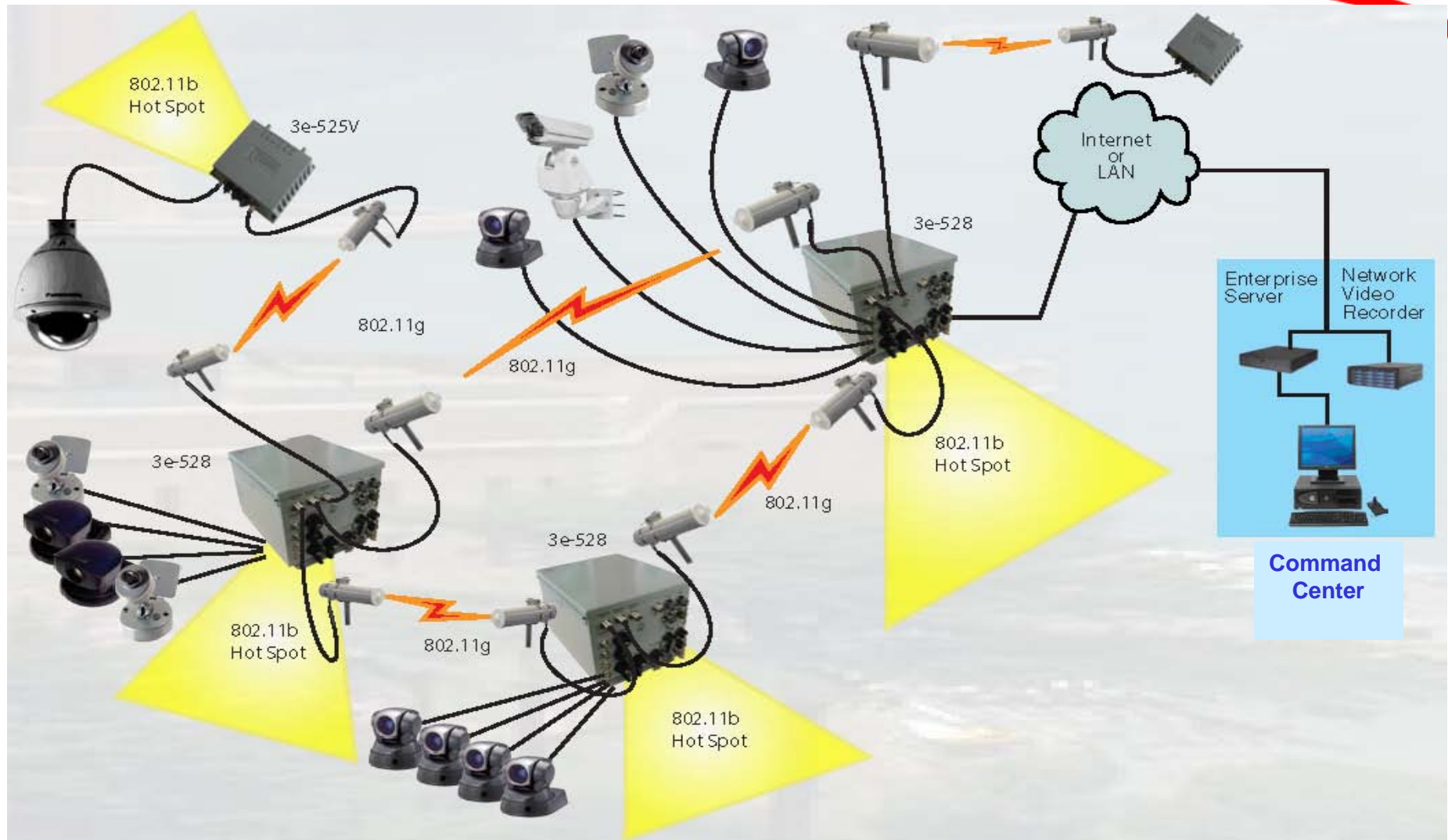
Benefits

- Highly secure - AES & 3DES encryption
- Per session, Dynamic Key Generation with Security Server software (purchased separately)
- Detects rogue APs
- RF management for variable power control
- Rugged for outdoor/indoor environments
- Lightning protection

Link to Data Sheet



Sensor Network – Conceptual



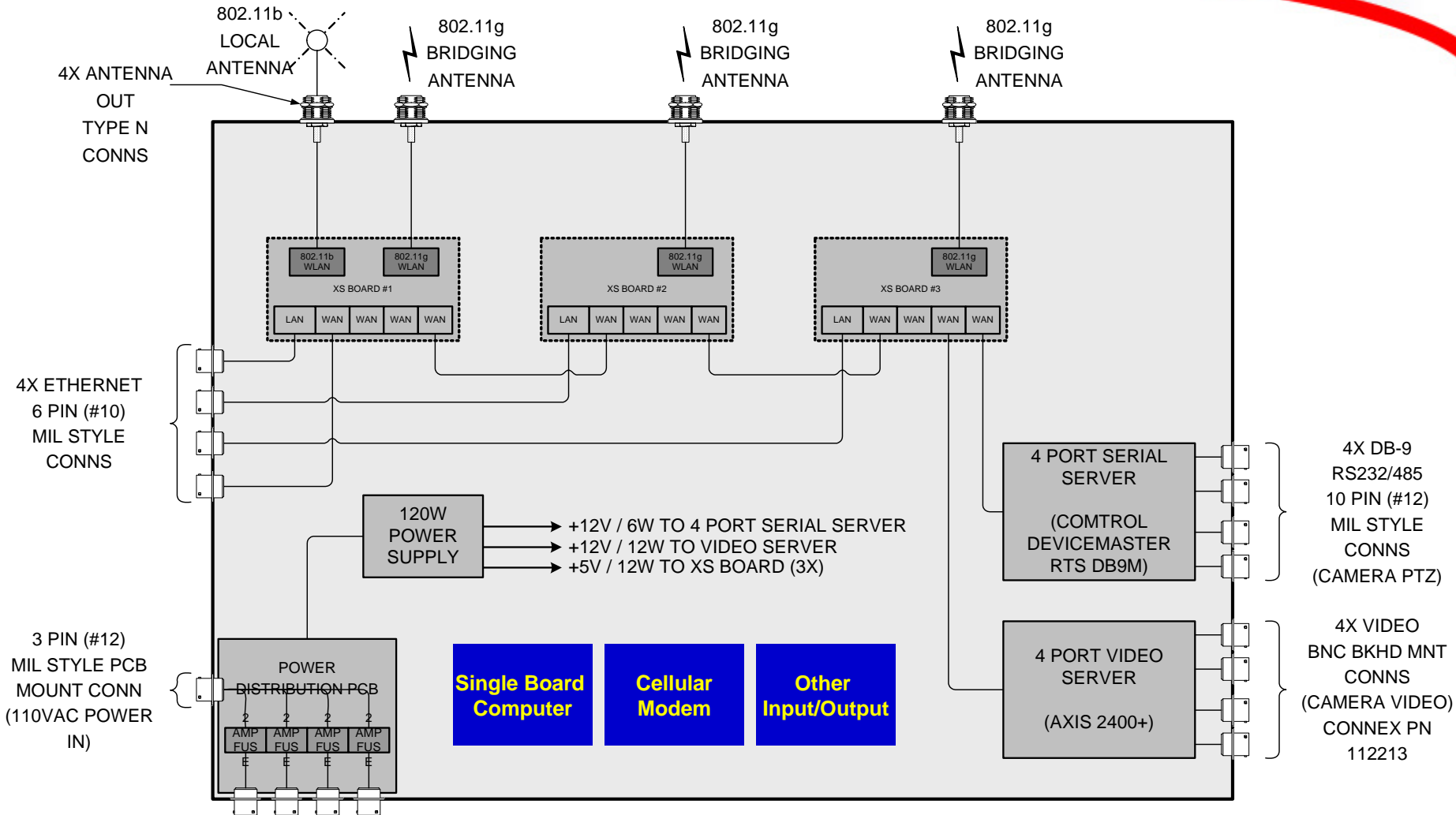
3e-528 Wireless Sensor Node

Target Platform for SensorNet Node



3e-528 Block Diagram

SensorNet Upgrade



Sensor Node

From Prototype to COTS



U.S. Navy – CAPS Project
Prototype – Repackaging of COTS

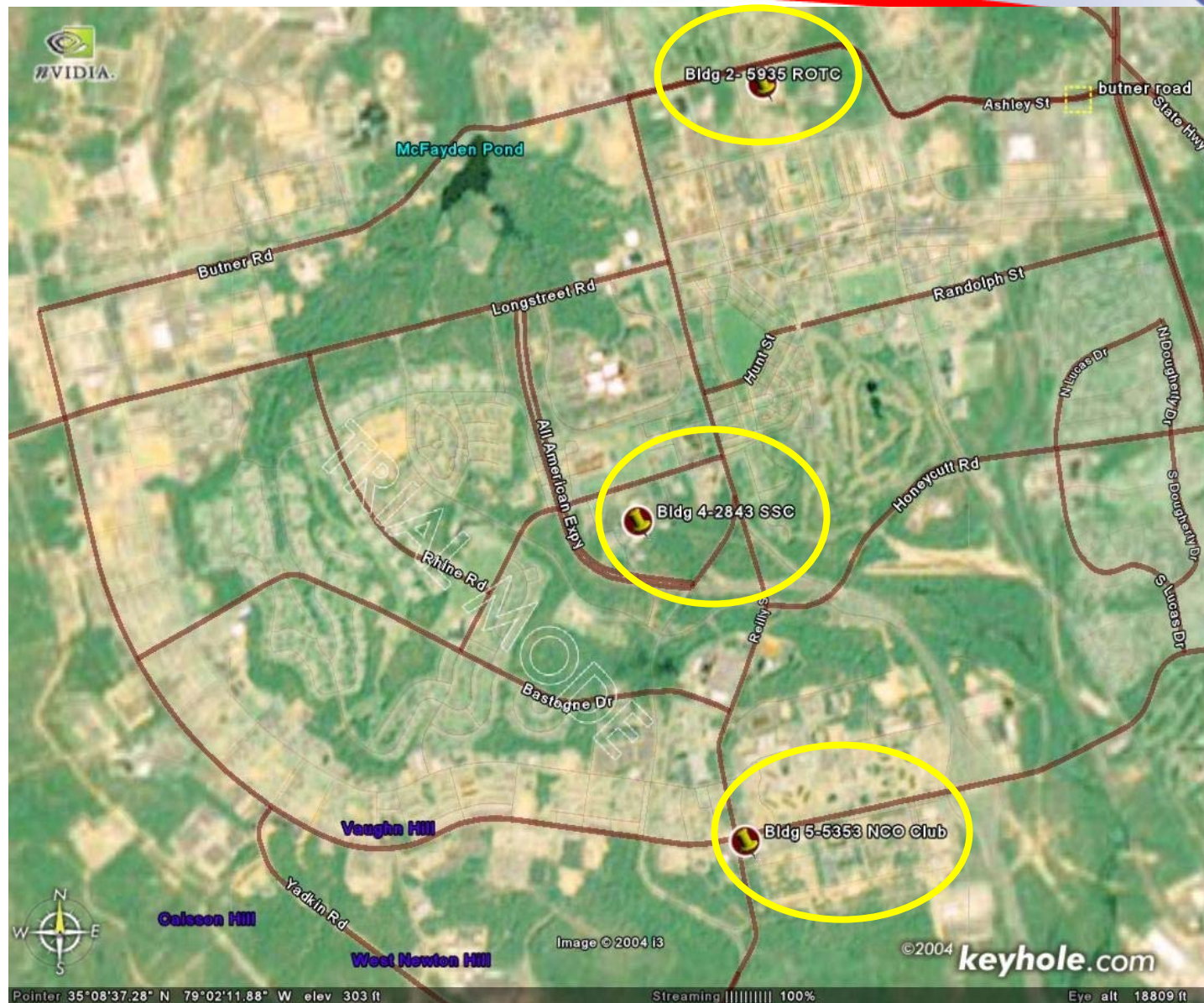
Final Product – Based on 3eTI Design

Fort Bragg

Pilot Deployment

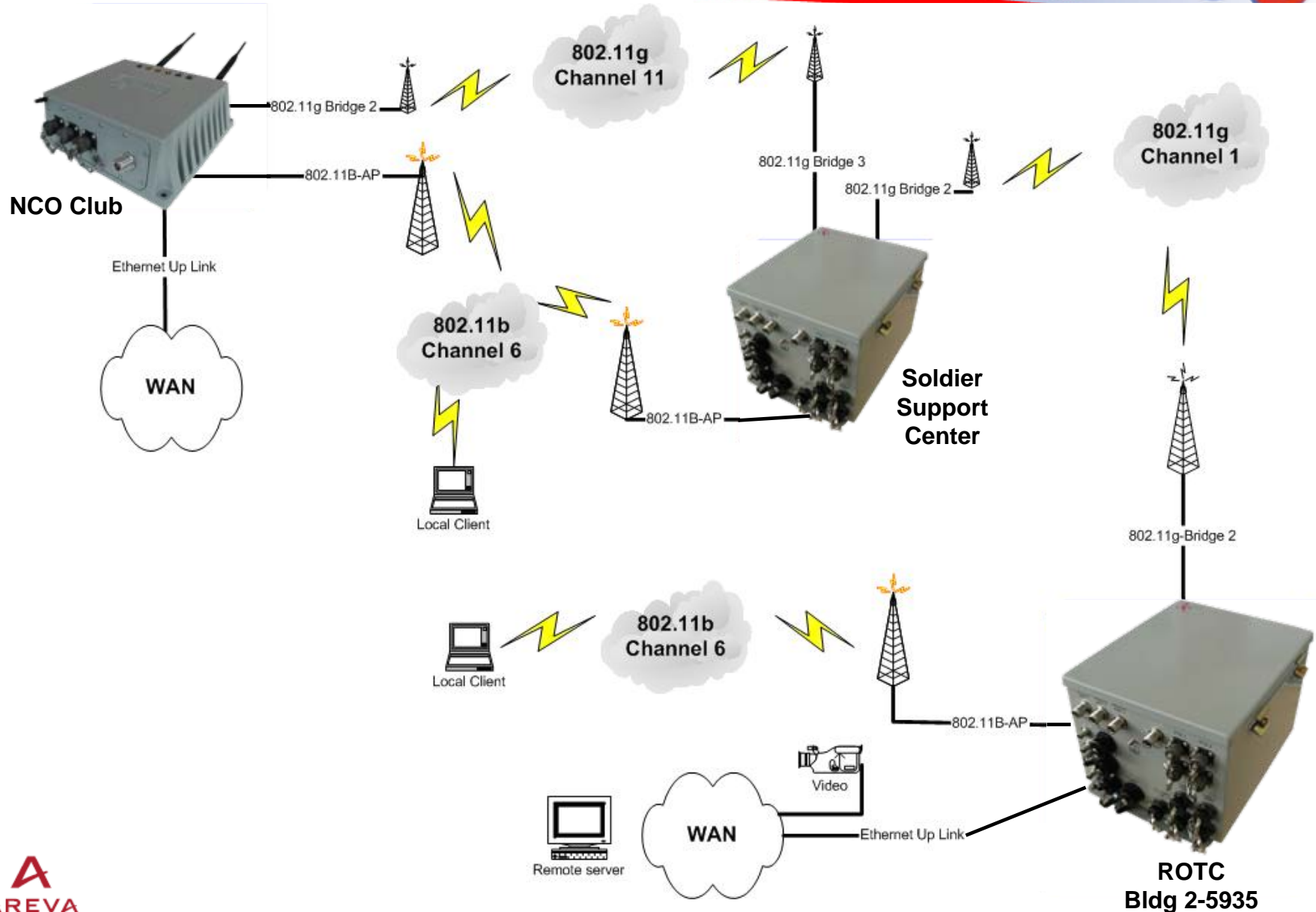
Demonstration for Army Science Advisors

4/4/05



Demonstration for Army Science Advisors

Pilot Architecture



- The 3eTI Team is working with DoD, ORNL, NIST, and OGC to promote Interoperability of Sensor Networks and Geo-Spatial Implementations
- The Commercial SensorNet Node will leverage our robust InfoMatics™ Platform and our FIPS 140-2 Validated *Secure Wireless Devices*.
- SensorNet Node will be inherently interoperable through compliance with IEEE 1451 and OGC SWE standards
- The 3eTI Team is currently working with ORNL and Ft. Bragg to finalize requirements and begin development

Thank you for your time.

Any Questions?